jumble? The large-type sections that connect these masses of confused notes are still more perplexing. Here, also, the commonplace-book predominates, but the extracts are worked up into some semblance of a continuous exposition. It is very seldom, however, that one can read a page on end without losing the thread. The reason soon becomes obvious. What is offered as a book is really nothing more than a transcript of rough jottings, in which Dr. Bastian had from time to time recorded his ideas in a form just sufficient to preserve a record for his own use. The sentences are often not even grammatical, and in brief the volume is only the roughest of rough note-books printed without revision. In spite, therefore, of the enormous labour and learning which it attests, the whole must be pronounced a failure, for the elementary reason that it is not a book. We trust that the publication may be useful to the author in helping him to get his superabundant material better under control, and so to produce hereafter something that is a book and can be read.

The ethnological picture-book is designed for young people, and its illustrations of cosmogonic and cosmographic ideas, of various conceptions of the future life and so forth, are well calculated to excite their curiosity and stimulate their interest in such things.

OUR BOOK SHELF.

Experimental Chemistry for Junior Students. By J. Emerson Reynolds, M.D., F.R.S. Part IV. Organic Chemistry. (London: Longmans, Green, and Co., 1887.)

THIS volume on organic completes the author's course of experimental chemistry. Whatever may be the opinions on the three previous volumes, there is no doubt this is the most rational attempt to treat organic chemistry practically—as a thing for students actually to do—that has as yet appeared. There is scarcely an experiment in the book that a student will be unable to do from the description given, and the order in which they are taken and general arrangement is the natural order of synthesis, proceeding from the less complex and easy to the most complex and least known.

The author begins with destructive distillation, and the production of alcohols, their salts, &c. The fourth chapter deals with metallic compounds or organo-metallic bodies. In the description of the manufacture of zinc ethide the method of making from zinc, C_2H_5I, and iodine might have been given, as the action is much quicker than with the Cu—Zn couple and the yield greater. The current of CO_2 can also be dispensed with advantageously. Two experiments here we must take exception to as being rather dangerous for beginners—sealing up sodium with zinc ethide, and in Experiment 691 making mercuric ethide as a sort of starting-point material. The author cautions against inhaling the vapour of this substance, as it is "supposed to be poisonous." We thought it was quite settled that it is about the most dangerous substance one has to deal with; and we certainly do not agree with the author that the method of employing mercuric ethide for making zinc ethide is the easiest of all methods for making the last-named substance.

In the remainder of the little book there is nothing either in arrangement or process to which objection can be taken, and undoubtedly it should be most useful to students attending a course of organic lectures. As a rule English students stop off with organic before they have really made its acquaintance; very few indeed continue its study long enough for it to be of any use to them. Most of the works in England where "organic chemistry" is the rule are obliged to obtain the services of German chemists; the English student's acquaintance with the subject generally stopping at the knowledge that there are such things as hydrocarbons, or "hydrocarbides," as the author of this book calls them.

Perhaps when such practical instruction is given in our schools as the course outlined by this book, we may begin to produce students who can go into "a works" and be trusted not only to follow a process but to originate new ones.

W. R. H.

The Farmer's Friends and Foes. By Theodore Wood, F.E.S. (London: Swan Sonnenschein, Lowrey, and Co., 1888.)

THIS is a well-meant and well-put-together little volume, giving an account of the life-history of most of the animals which, for good or for evil, come across the path of the British agriculturist. Throughout, the attempt is made to prove that, when it is necessary for the saving of a crop to destroy any animal, it is far better to trust to Nature, as being more competent, than to man; but then this seems to beg the whole question, as it presumes that man has not already very much interfered with Nature's regulations.

The volume is, in part, the result of personal investigation, but the author quotes freely from all our best-known writers on the subjects of which he treats.

The figures are good. A table of contents would have added to the usefulness of the work, especially as the index is not very detailed. The volume may be safely placed in the hands of all interested in the subject.

The Story of Creation. By Edward Clodd. (London: Longmans, Green, and Co., 1888.)

THE author of this book does not pretend to make his readers acquainted with new facts and ideas. His object is to present a popular exposition of the theory of evolution, using the word evolution in its widest sense. The work is divided into two parts—one descriptive, the other explanatory. In the descriptive part he begins with a chapter on matter and power. He then considers the distribution of matter in space, and gives a general account of the sun and the planets, of the past life-history of the earth, and of present life-forms. In the explanatory part he discusses the questions relating to inorganic evolution and to the origin of life and life-forms, and sets forth in logical order the arguments which are held to establish the truth of Darwin's theory of the origin and development of species. A final chapter is devoted to social evolution, including the evolution of mind, society, language, art and science, morals, and theology. The book is vigorously written, and well illustrated; and readers who have had no special scientific training will find that it enables them to understand and appreciate some of the greatest and most fruitful generalizations of modern science.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

Botanists and the Micromillimetre.

I NOTICE that in a review of a "Manual of British Discomycetes" which appeared in NATURE on February 9 (p. 340), and apparently also in that work itself, the word *micromillimetre* is used as equivalent to the thousandth of a millimetre.

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I have made some inquiry, and am told that it is now commonly employed by biologists, and especially by botanists, with that meaning.

As it would be very unfortunate if the same word were habitually used in different senses by students of different branches of science, may I be allowed to point out that, according to the definitions of the C.G.S. system, a micromillimetre is the millionth of a millimetre.

In the well-known Report of the Committee of the British Association for the "Selection and Nomenclature of Dynamical and Electrical Units" it is laid down that the prefixes *mega* and *micro* are to be employed "for multiplication and division by a million."

This ruling has been generally accepted not only by scientific men, but also by those engaged in commerce. Megohm and microfarad are terms which are used in contracts, and are universally understood to mean a million ohms and a millionth of a farad respectively. It will be hopeless to try to introduce scientific systems of measurement into the affairs of daily life if scientific men themselves disregard the rules on which those systems are framed.

It would also be particularly confusing if the micromillimetre were wrongly used by microscopists. In its proper sense it is the most convenient unit in which to express molecular magnitudes. It has been employed for that purpose by Sir William Thomson and others in England, and also by physicists abroad. If the micromillimetre of the microscopist is 1000 times too large, all sorts of mistakes will be rife as to the relative dimensions of molecules and of the smallest objects visible with the microscope.

The proper name for the thousandth of a millimetre (μ) is the *micromĕtre*, and though the similarity of this word to *micromĕter* is no doubt a drawback, it is not likely that confusion could often arise between them.

If, therefore, I am rightly informed as to the custom of botanists in this matter, I beg respectfully to suggest that they should bring their nomenclature of units of length into conformity with the definitions of the C.G.S. system. Otherwise there will be a permanent confusion between the *micrometre* (μ) and the micromillimetre ($\mu\mu$). ARTHUR W. RÜCKER.

Science Schools, South Kensington, February 17.

"The Teaching of Elementary Chemistry."

ALLOW me to draw the attention of the chemical section of your readers to a few highly misleading passages in the two books reviewed under the above heading in NATURE of January 19 (p. 265).

On p. 65 of the "Elementary Chemistry" we read:—

"Hence when sodium and water interact, a portion of the hydrogen which was combined with oxygen is evolved as hydrogen gas, and another portion enters into combination with the sodium and the oxygen to produce caustic soda."

On pp. 116–17 is to be found the following astounding passage:—

"To prepare Cl_2O, mercuric oxide (HgO) is heated in a stream of dry chlorine. When mercuric oxide is heated it is decomposed into mercury and oxygen; therefore by passing chlorine over heated mercuric oxide we carry out a reaction in which oxygen is produced in presence of chlorine."

In the "Practical Chemistry," under Experiment 1, Chapter II. (p. 6), occurs the following warning to the student:—

"Do not remove the lid at any time for more than a second or so, else some of the magnesia will be volatilized and lost;" while on p. 285 of the "Elementary Chemistry" we read:—

"No compound of Mg has been gasified."

Even this contradiction is excelled by one on pp. 62 and 63 of the "Practical Chemistry," which is not so manifestly a slip. We read (p. 62):—

"The reactions between aqueous solutions of alkalies and the three elements, chlorine, bromine, and iodine, are similar; compounds of similar compositions and similar properties are produced under similar conditions."

Under Experiments 19 and 20, which follow, the student is told to treat cold solutions of potassium hydroxide with chlorine and bromine respectively. The well-known changes are described, and the bleaching properties of the solutions after addition of a little acid, are to be tried. Then follows (p. 63):—

"Exp. 21. Perform an experiment similar to 19 and 20, but use *iodine* in place of chlorine or bromine: the liquid which is produced does not bleach. No compound of iodine analogous to $KClO$ and $KBrO$ has been obtained."

Truly this is "seeing things as they are" with a vengeance.

Z.

Natural Science and the Woolwich Examinations.

MAY I be allowed, as one of the most experienced science masters in the public schools, to say a word in reply to Mr. Gurney's letter in NATURE of this week (February 16, p. 365)?

There seems to me a general fallacy running through that letter arising from "the absence (on the writer's part) of clear discrimination" between the nature and methods of mathematical science (which, as J. S. Mill taught us long ago, are mainly *deductive*) and experimental science (which proceeds by *inductive* methods). It is on this ground mainly, coupled with the extent to which it cultivates the faculty of *observation*, that we claim for it a special educational value.

After an educational experience at least as extensive as Mr. Gurney's, I join issue with him most distinctly on this point. I am afraid there lurks behind Mr. Gurney's depreciation of the educational value of science the disappointment which other mathematicians have experienced in finding that the man who takes to experimental science as a mere excursion-ground for the diversion of the mathematician is not infrequently brought to confusion by Nature. *Science is something more than measurement.* Mr. Gurney's notion that mathematics and a knowledge of French and German are a sufficient groundwork for true scientific knowledge is such a confession on his part of the small value he attaches to experimental demonstration and to laboratory training (or to field-work in the case of geology) as is sufficient to put him out of court as a witness on this question. Nor do I think that he is competent to speak with any authority on the work done in the public schools. If he fancies that the best boys of the public schools go to Powis Square to finish their education, he is labouring under a delusion.

The whole argument of the letter is retrogressive; nor is it strengthened by the writer's condemnation of a "smattering" of science, which is no discovery. But I maintain that a boy can, by the age of eighteen, get a sound groundwork in science laid, though not by the cramming system; and that to this the term does not apply at all. Again, he condemns premature specialization of a boy's studies in favour of science, while he inconsistently advocates a much narrower specialization in favour of mathematical studies.

How far Mr. Gurney is from being convinced by his own arguments is shown by the fact that in the concluding paragraph of his letter he practically surrenders the point on which the whole question turns.

In conclusion I would commend to his careful consideration the letter which appears in the *Times* to-day from the head master of Clifton College, whose competence to form a judgment on the educational aspect of this question I suppose no one doubts. A. IRVING.

Wellington College, Berks, February 17.

WITH your kind permission, and in consideration of the importance of the matter, I crave leave for space for a few remarks in addition to those contained in my reply to Mr. Gurney.

(1) Looking at the history of education in this country, we can account for, though we deplore the existence of, a prevalent notion, a sort of fashionable superstition, which regards scientific studies as outside the range of what is called "culture"; a superstition for which some of those who have spoken in the name of science are not altogether unanswerable, but which derives its chief strength from that profound ignorance of natural science—its nature, its methods, and its object—upon which so large a proportion of educated Englishmen seem rather to pride themselves than otherwise. There can be but little doubt that this has been turned to account as an influence in favour of the contemplated scheme.

(2) It is in no spirit of hostility to literary studies that one writes in these terms; on the contrary, it is as a lover of literature of the better sort that one would gladly see the literary spirit in this country, as in Germany, strengthened and braced by the strong atmosphere of scientific criticism, and a little more first-hand acquaintance with things as they are, which is the true

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